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ORIGINAL ARTICLES.

CIRCULATORY PHÆNOMENA IN THE EYE.*

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A consideration of the circulatory phenomena in the eye includes primarily those caused by the flow of the blood itself, pulsation, etc., and secondarily those caused by changes in the bloodvessels which may arrest or modify the flow, arteriosclerosis, traumatism, etc.

The diagnostician can usually determine the condition of the heart and larger bloodvessels by physical signs, to which he may add x-ray examinations. He can further determine the blood-pressure, the pulse-rate and its quality, and record it graphically by specially constructed apparatus. A general clinical survey added to his laboratory findings may give him the confidence of complete mastery of the case under observation. However, by the study of the phenomena of the peripheral circulation in the eyes he may often obtain definite information which he cannot afford to overlook.

The eye has three vascular systems—retinal, uveal and conjunctival. They are quite separate and distinct in their arrangement and special functions. From the standpoint of vision, primary importance belongs to the retinal blood supply. It comprises the central retinal artery and vein, entering the optic nerve about two-thirds of an inch behind the globe and appearing on

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the optic disk usually as superior and inferior branches each, at once further dividing into temporal and nasal. Except for very slight anastomoses existing between branches of the ciliary and retinal vessels at the disk, they are terminal vessels similar to those supplying the cerebral cortex. Since the invention of the ophthalmoscope by Helmholtz sixty years ago, the study of the circulatory phenomena in the retina in health and disease has been an exceedingly fascinating one. So thoroughly has this field been canvassed, and the results recorded and confirmed by one observer after another, that we can hardly expect any new facts to be added. However, the exact aetiology of some well-known conditions is not cleared up and calls for continued close observation and study.

Without the aid of any instruments, one can, under favorable conditions of light and shadow, observe the movements of the blood-corpuscles in his own retinal capillaries. With the ophthalmoscope the corpuscular movements are not revealed, its magnifying power not being sufficient. But under certain conditions pulsations can be observed in the veins, arteries or capillaries.

The venous pulse is usually a physiologic manifestation seen at the disk in the larger veins as they bend into the funnel-shaped canal of the optic disk. If absent, it can be produced by pressure on the eye under examination. Donders early explained that it was due to increase of pressure within the eye by each arterial pulse wave, this causing compression of the veins. A general venous congestion with pulsating jugulars makes the venous pulse in the eye more marked. Also it appears more prominently in cases of aortic or tricuspid regurgitation.

Arterial pulsation in the retina is a pathologic phenomenon. Again the pulsation is most clearly visible at the optic disk where the artery emerges. It is synchronous with the systole and is caused by the presence of some resistance to the blood stream on entering the eye. This resistance may be pressure (hypertension) within the eye, as in glaucoma; or be caused by optic neuritis or orbital tumors; or be due to arteriosclerosis; or to aortic insufficiency, as first observed by Quincke.

The capillary pulsation consists in the successive rhythmical pallor and reddening of the disk and is similar in aetiology and appearance to capillary pulsation as observed in other tissues, as under the finger nails.

It is beyond the scope of such a paper as this to present the

technical points in the diagnosis of the various pathologic conditions which might be classified with circulatory disturbances in the retina. They are represented on the plates to be shown much better than they could be described verbally.

These represent some of the more frequent examples of this type of cases, but by no means all of them, nor are they always so clearly differentiated.

Papillo-œdema (or choked disk) is a well-known circulatory disturbance of great clinical significance.

Perhaps the most striking of all ophthalmoscopic pictures is that produced by embolism or thrombosis of the central retinal artery. The bleached out retina, the slight movement still evident in detached columns of blood in some of the vessels of the retina if the case is seen early enough, the cherry-red spot in the macula, can never be forgotten after being once witnessed. A similar picture on a small scale may occur when the small branches of the artery are obstructed. Scarcely less interesting and more frequent are hæmorrhages in the retina, due to venous obstruction.

It may be difficult at times to distinguish retinal conditions caused by toxic substances in the blood leading to retinal inflammation and hæmorrhages, as in diabetes and Bright's disease, from very similar appearances produced by mechanical obstruction to the venous circulation.

One clinical report here may suffice to illustrate:

Miss W., aged 20 years, consulted me two years ago on account of loss of sight in her right eye, said to be due to "kidney disease." This probable ætiology had been stated to the patient after an ophthalmoscopic examination by an oculist in another city without waiting for the findings by a urinalysis. The ophthalmoscopic examination showed diffuse hæmorrhagic areas and patches of exudate in the retina of the *right eye only*. The fundus of the left eye was entirely normal. Vision in the right eye was much reduced, the left eye normal. A urinalysis seemed to confirm the opinion previously expressed and showed a large percentage of sugar and a trace of albumin.

However, the ocular trouble was entirely one-sided. She suffered from headache on the right side of the head and had for some time previous to the loss of vision. The ophthalmoscopic picture was not unlike what might accompany partial obstruction of the retinal vein or of several of its branches. Some of the cardinal general symptoms of genuine diabetes did not exist. An

examination by a rhinologist to exclude disease in the accessory nasal sinuses was urged. The examination revealed a *severe sphenoidal suppuration* on the *right* side. Under therapeutic and operative treatment of the sphenoidal suppuration the retinal condition cleared up and sight in the right eye was restored to normal. The field of vision became as perfect as was that of the healthy eye. A year later the ophthalmoscopic picture showed barely a few small scars in the retina, so small that the field does not show the defect and they are entirely unnoticed by the patient. Coincident with this improvement in the eye the urinary findings became normal without change of diet or special consideration of that condition in the treatment.

The presence of sugar in the urine can be explained if we recall the intimate anatomic relation between the pituitary gland which rests on the sella turcica over the large sphenoidal cell. A suppurative process in the sphenoid might produce some pituitary disturbance and such disturbances have been known to be accompanied by the presence of sugar in the urine. The removal of this cause resulted in the cure of the glycosuria, as well as in the cessation of the secondary monocular venous obstruction.

Usually diabetic retinitis involves both eyes.

Momoji-Kako¹ reports from Uhthoff's clinic at Breslau that nineteen out of forty-five cases of diabetic retinitis were *monocular*. It is interesting to speculate how many, if any, of these were comparable clinically to the case here noted. Rhinologic examinations were not made in any of them, or at least no findings are reported. This emphasizes that *all circulatory* phenomena in the retina should be judged not only from the ophthalmoscopic picture, but with the careful consideration of every clinical detail.

The most highly vascularized tissue in the eye is the uveal tract, the choroid, ciliary body and iris. These tissues are supplied by the short and long posterior and the anterior ciliary vessels, the latter anastomosing with the conjunctival vessels at the corneal limbus. They have a slight anastomosis as before noted with the retinal vessels at the optic disk. Special features in the uveal circulation are: the vorticosse veins of the choroid, the venous plexus in the ciliary processes resembling erectile tissue, the arterial circles in the iris, and the canal of Schlemm, a unique venous plexus at the junction of the cornea and sclera.

1. Momoji, Kako: Beitr. z. Kenntn. d. Augenaffect. bei Diabetes mell. Klin. Monatsbl. f. Augenh., 1903; ref. in Encyclopédie Française d'Ophthalmologie. Tome 6, pp. 835, 838.

They have highly important nutritive, secretory and absorptive functions, which are directly influenced by the general blood pressure, arteriosclerosis, etc. The direct observation of the circulation in either choroid or iris is prevented normally by the large amount of pigment in the cells and stroma of these tissues (albinos excepted).

The dreaded disease, glaucoma, with its obscure ætiology, always calls for a comparative study of the general circulatory system. Both its operative and therapeutic treatment attempt to secure drainage from the globe usually at the irido-corneal angle (canal of Schlemm). But glaucoma can be caused by obstruction of the venæ vorticosæ. This is probably the pathogenesis of the increase of intra-ocular tension often encountered in choroidal sarcoma. In a case² I reported five years ago, a thin choroidal sarcoma (less than 1 mm. in thickness at any point) invading about three-fourths of the area of the choroid and involving several venæ vorticosæ produced severe glaucoma for four or five months before enucleation. In this case it could not have been the mass of the tumor which produced the glaucoma. The sight was lost twelve months before symptoms of glaucoma were present, indicating that the tumor and not the glaucoma was the primary condition.

Histologic examination showed the lens and iris pressed against the cornea, and the ciliary body completely flattened by the pressure which accumulated in the eye after obstruction of the venæ vorticosæ by the sarcomatous mass.

This patient died seven weeks after exenteration of the orbit from unusually large metastatic growths in the liver, lungs, kidney, etc., showing in another way the well-known free vascular communication of the uveal tract with the general system.

The greatest similarity in the vascular supply of the eye to the general systemic type of circulation exists in the conjunctiva. The ocular conjunctiva loosely stretched over the white sclera is the most accessible and favorable membrane for study of certain circulatory phenomena. Ophthalmologists themselves are to blame that these have not been more generally observed. It was reported that at a conference of internists in one of our large cities some months ago to which ophthalmologists had been invited to discuss arteriosclerosis in the eye, it was an internist and not an ophthalmologist who reminded those present of that common sign of brittleness of the conjunctival vessels, the spon-

2. Luedde: Ueber Flächensarkom d. Auges., v. Graefe's Arch. f. Ophth., 1906, Band lxiii, Heft 3, S. 468-480.

taneous subconjunctival effusion of blood. The examination of the retina ophthalmoscopically has diverted our attention from the simpler manifestations at the threshold of this miniature camera obscura, the human eye.

Something of the general character of the conjunctival vessels can be determined by the aid of a good magnifying glass. So much more can be done with a proper instrument that I shall not discuss what might be done without it. The instrument of choice in this study unquestionably is the Zeiss-Capski binocular microscope, or so-called corneal microscope. With this instrument, as pointed out by Professor Schleich,³ even the movements of the blood corpuscles can be studied with ease. His was not the first observation of the circulation in the conjunctival vessels. Similar observations had been made by Coccus in 1852. Preiss, Friedenwald, Angstein, de Wecker, Liebreich and Bajardi also had recorded such studies previously, but their methods had been so cumbersome and difficult that their work had not been followed up and was almost forgotten. Schleich justified his report by the fact that the Zeiss binocular microscope greatly simplified the procedure and that it afforded greater magnifying power.

The objection which remained was the rather deficient power of illumination. This I believe I have corrected in a simple manner.⁴ One advantage of the stronger illumination is that you have greater penetration for deeper vessels.

What purpose can be served by these observations beyond the general interest in physiologic facts? To determine the clinical significance I have examined a series of about 500 eyes in the last year. These examinations have shown the need for further study, not only of the eye but of the entire system in relation to the findings. In some instances this was done through the aid of the family physician, the internist or the neurologist. Some interesting facts have been elicited, but the records are too incomplete to warrant generalizations and conclusions.

In the first place, when looking at the conjunctival vessels with sufficient power to show corpuscular movements, every observer is impressed with the variety of movements there presented. The velocity of the current in every vessel varies from that in col-

3. Schleich: Sichtbare Blutströmung in den oberflächlichen Gefäßen der Augapfelbindehaut, *Klin. Monatsbl. f. Augenh.*, März, 1902, S. 177.

4. Luedde: Improved Illumination for the Zeiss Binocular Corneal Microscope, Used in the Study of the Episcleral Vessels and Their Circulation, *Arch. f. Ophth.*, 1911, xl, No. 4, pp. 373-377.

lateral and anastomosing vessels more or less. Schleich fixed the variability in the capillaries from 0.50 to 0.85 mm. per second. His highest figure may be correct, but his lowest is not. One can scarcely trace the movement of the corpuscles accurately when they move faster than 0.75 to 0.80 mm. per second under the microscope. But I have timed the corpuscles with an accurate stop-watch and found them to rest stationary except for some little jar, which, however, did not dislodge them for 3 or 4 seconds at a time, and then often they would move at a rate not greater than 0.10 to 0.15 mm. per second until they reached some anastomosing vessel or were lost from view in the deeper loops under the tissue. I would therefore state the capillary rate from 0 to 1 mm. per second with the average between 0.45 and 0.60 mm. per second. These variations occur under conditions otherwise entirely normal and occur in the majority of cases examined. They may therefore be considered physiologic.

The same may be said of another phenomenon striking to the first observer. I refer to the fact, also noted by Schleich, Stargardt⁵ and others that the vascular system is not full of the blood elements all the time, or perhaps at any time, over the entire body. While watching the white field of the apparently bloodless sclera between the branches of larger vessels, one will see an occasional column of blood, sometimes made up of only one-half dozen red corpuscles, again of a larger number, pass along a capillary and disappear without a trace, and after waiting a few seconds or longer this is repeated. If the examination is prolonged or there is some irritation, the interval is shortened; the flow may even become continuous. Ordinarily this occurs only in the smaller capillaries—those through which the corpuscles pass in single or double file, having a diameter of 10 to 12 microns. But after a drop of adrenalin solution in the conjunctival sac, one may see a similar occurrence in a vessel which normally has a caliber three or four times as great. In the larger vessels with a strong, steady flow, adrenalin does not seem to retard or accelerate the flow, but the volume passing is lessened. I would not state this as a definite conclusion as my experiments with adrenalin have been only recent and few in number, and I know of no other report along this line. Obviously such experimentation, the dropping of such simple non-irri-

5. Stargardt: Ueber Pseudotuberculose und gutartige Tuberculose des Auges, mit besonderer Berücksichtigung der binocular mikroskopischen Untersuchungsmethode, v. Graefe's Arch. f. Ophth., Band lv. S. 469-506.

tant solutions into the eye, is not difficult or even disagreeable for the individual who submits to the test, and may throw some light on questions not quite clear in the physiology and pathology of the circulation.

Almost the opposite to the macroscopic effect of adrenalin on the conjunctival tissue is that of dionin. So far my results with it have been uncertain. I have examined after its use only in cases where it had been applied for therapeutic purposes, and some of these patients could not be examined for more than a few seconds without discomfort. It seems to increase the amount of blood actually present in the tissues along with the well-known lymphœdema.

In the great majority of cases the flow of blood with all its stops and hindrances is in the same general direction in a given vessel and its collaterals, but there are cases in which there is regurgitant flow which is entirely independent, it seems, of the pulse-rate.

This condition first impressed me in a married woman about 40 years old, who wanted glasses for her near work. She asked me to look at her eyes with reference to the presence of kidney disease as she had noticed that her limbs were swollen just over the shoe tops, at the close of the day. The ophthalmoscope revealed nothing abnormal, but a routine examination of the conjunctival vessels showed that in her case the flow of blood did not always remain the same. It would regurgitate so long sometimes that it was difficult to tell in which direction it flowed normally in certain vessels. I apprised her physician of my findings, and he made a thorough examination of her heart and kidneys, but found nothing abnormal. Repeated examination showed the same condition. There was evidently in this case normal central heart action but poor peripheral control. We might refer to it as imperfect peripheral compensation—a vasomotor phenomenon. I have observed about a dozen such cases among people of different ages and conditions, I will not tire you with the details, but mention a few of them as briefly as possible.

One was a young man of 23, examined after fainting in my office. Another was a hysterical woman of 50, examined after a spell of vomiting induced by reflection of light into her eyes from the ophthalmoscope. With these the condition was probably temporary. In the first case it seemed to be constant. It was likewise constant in a man of 50, who had been at the head

of a large educational institution and had suffered a "break-down" from which he failed to rally.

One case where I expected to find regurgitation and failed was that of a woman of 40, who had a variety of cardiac murmurs but a rhythmic pulse. She was feeling well and was carefully following the regulations and treatment directed by a capable physician.

There is good reason to believe that this condition is not merely local in the conjunctiva. Adrenalin, for instance, did not seem to modify it when dropped into the conjunctival sac.

Several experiences led me to suspect that this condition may be present in normal individuals when they are very tired, due to an exhausted vasomotor control.

A single experience suggested that such regurgitation may be normally present in the smaller peripheral vessels during the drowsiness that precedes sleep, and perhaps this is the manner in which the activity of the cerebral circulation is reduced, permitting sleep to occur. Observations of the same individual at various times for several days are needed to clear up this point.

It would be interesting also to note what observations made at stated intervals after the ingestion of certain drugs would show in the peripheral circulation. I have not had the time to follow up this line of study. So far as I know it has not been done by any one, with the conjunctival circulation as an index.

One use for this method for the observation of the flow of blood I have not mentioned. It may be of medico-legal importance. No doubt it would be one means of confirming the total cessation of all movement of the blood-stream in case the question of "suspended animation" or actual death needed to be decided.

It goes without saying that any method which enables us to see the movements of these corpuscles also permits us to detect the first changes in the caliber of the smallest vessels. That is where the most widely spread of all diseases begins. I refer to arteriosclerosis.

Professor Rohmer,⁶ in addressing the National French Society of Ophthalmology in a classical paper on arteriosclerosis of the eye, after referring to its causes (various diatheses, intoxications and infections), says: "In sum total, arteriosclerosis is nothing but the *natural end* of the *evolution of our arterial system*, and no matter how sheltered we may have been from all

6. Rohmer: Arteriosclerose. Bulletins et Memoires de la Société Française d'Ophthalmologie, 1906.

baneful influences, it will come to us sooner or later, if Providence extends our existence."

The early recognition of this condition may be helpful by enabling us to correct or avoid harmful influences. We are enabled by this instrument to see miliary aneurysms long before they break down. It does not follow that if its initial stages are present in the retina or conjunctiva it must be equally advanced in all parts of the body. They may be even more advanced elsewhere than in the conjunctiva. However, I have yet to see the case where arteriosclerosis was pronounced in the ocular tissues that there were no signs of it whatever in other organs. Of general interest in this connection was a series of cases examined with Dr. W. W. Graves.⁷

Some of these problems are of lively interest to every physician. It is to be hoped that many observations by different investigators will clear up existing doubts and contribute to the growing clinical importance of the examinations of the ocular circulatory phenomena.

7. Graves: The Scaphoid Scapula a Frequent Anomaly in Development of Hereditary, Clinical and Anatomical Significance, *Med. Rec.*, May 21, 1910; etc.

CORRECTION.

By mistake the references to de Schweinitz's paper in Dr. Gross's article in the July number of this JOURNAL were given without the mention of their source. They were taken from de Schweinitz's article in Posey and Spiller.

TRANSLATIONS.

A CASE OF PERSISTENT PARALYSIS OF THE ACCOMMODATION AFTER DIPHTHERIA.*

BY DR. H. OLOFF.

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Translated by Adolf Alt, M.D.

Among the many sequelæ of diphtheria the paralysis of the accommodation is well known, not alone on account of its comparative frequency, but also because it is so prone to a complete healing. It is, therefore, looked upon as the least harmful symptom in the course of this infectious disease, which is still so much to be dreaded in spite of the serum therapy. The modern treatment of postdiphtheritic paralysis of accommodation corresponds with this opinion. To-day the application of the constant current, formerly so much in vogue, has been abandoned and we are satisfied to enjoin rest of the eyes and to tone up the general condition by correct feeding and, perhaps, by roborantia.

At the longest, in six months, usually much sooner, the paralysis is, as a rule, completely cured. A longer duration of the paralysis is of the greatest rarity.

In the few cases in which the patients later on still now and then complained of slight disturbances in near-work, the range of accommodation was found to be perfectly normal. There existed as a part of the general weakness following diphtheria a nervous asthenopia, as it is often seen accompanying other exhausting infections and other diseases which do not produce paralysis of the accommodation.

Jacobson even thinks that in some hypermetropes he has seen, after the healing of a postdiphtheritic paralysis of the accommodation, a diminution of the hyperopia, and he explains this by assuming that during the paralysis the lens has become flatter in consequence of the tension of the zonule of Zinn—an opinion which has not been accepted by others.

In literature I have found only three cases in which the paralysis lasted more than 6 months.

*Klin. Mtsbl. f. Augenhk., May, 1912.

Schmidt-Rimpler saw a case of postdiphtheritic paralysis of the accommodation in which a slight paresis was still present after 6 months.

The second case is reported by Muehsam. He reported in 1900 to the Berlin Ophthalmological Society a case of postdiphtheritic paralysis of the accommodation which when observed by him had existed for 4 years. Details are wanting, so that the true postdiphtheritic character of this case is doubtful.

The third case was reported by Wiegmann (*Klin. Monatsbl. f. Augenh.*, XLVIII). Contrary to Muehsam's case there was a paresis of accommodation which quickly disappeared in the left eye, while in the right eye it was still in existence three years later and disappeared only after the lapse of a further year. Here, too, the picture was not that of a pure postdiphtheritic paralysis of the accommodation, since there was, also, a contemporaneous paralysis of the sphincter pupillæ, causing a complete mydriasis.

A few months ago I had occasion to observe a pure case of isolated persistent paralysis of the accommodation after diphtheria, which was interesting on account of its long duration. On account of the scarcity of such cases I may be justified in giving it in detail.

To Privatdozent Dr. Stargardt, who was kind enough to examine the case, also, and to verify my results, I herewith offer my thanks.

Seaman N., of the first division, 20 years old, attracted my attention when he was examined as to his fitness for battery service, on account of his poor near vision.

The powerfully and faultlessly built man had normal distant vision in the right eye. A myopic astigmatism of 0.5 D. lowered his left vision to 6/7. Objective examination of the refraction of the R. E. showed E.

Pupils equally wide, faultless reaction. No diplopia. Movements free in all directions. Cornea, iris, fundus normal in both eyes.

Punctum proximum: R. S. with +5 D. 16 cm.; +4 D. 20 cm.; +3 D. 33 cm. At this distance he can still read the finest print; with +1 D. he still reads Niden No. 3 at 40 cm.; with weaker glasses, or without any, only large letters (Niden No. 6) at about 50 cm., by squinting the lids.

In the L. E. the conditions are even less favorable. Niden No. 1 is read with +3 D. at 33 cm.; with +4 D. at 25 cm.; with

+5 D. at 20 cm.; with +6 D. at 16 cm. With weaker glasses he recognized large letters only and great distance, like with the R. E.

According to this the accommodation in the R. E. was almost totally (amplitude=1 D.), in the left eye completely, paralyzed.

The statements were always definite and exact, so that the thought that he might exaggerate appears at once as improbable. The further proofs were:

1. Objective control of the accommodation by skiaskopy. When an eye with normal accommodation is ordered to fix a finger at about 20 cm. distance a reversion of the shadow takes place, since the eye becomes myopic by accommodation. In the patient no reversion occurred, either in the right emmetropic eye, or in the left eye with its cylindric correction.

2. The anamnesis. N. made the following statements: In February, 1908, while on board the schoolship Koenig Wilhelm, he had suffered from an attack of tonsillitis with high fever and had been sent to the hospital on land on account of its severity. From his record a follicular tonsillitis with very high fever had been diagnosed, which kept him in bed for 11 days. Although it is stated that there were whitish deposits, no effort seems to have been made to see whether they were of a diphtheritic nature, since there is no record of a bacteriological examination or a serum injection. Sporadic cases of diphtheria are, however, found on all war vessels. About 3 weeks later N. noticed for the first time that he saw poorly nearby; while formerly he had had no difficulty in reading, he could do so now only when holding the book far off. As far as he remembers this condition was at first not as bad as it is now but became rapidly worse. His distant vision was as good as ever. He definitely states that he had no other disturbances, like diplopia, difficulty in swallowing, etc. While before the disease he had been a good shot, he could now no longer see the sights properly for taking aim. When sewing and mending, which the seamen have to do themselves, he had such difficulty in threading the needle that he had to ask the help of others. The condition was not noticed in his service as there was on board little occasion for shooting exercises. Moreover, as he served for advancement, he took good care to hide his defect, for since the wearing of glasses is forbidden in the marine service he would have had the greatest difficulty in his future career.

In order to be sure as to the aetiology of this paralysis of the

accommodation, I searched especially for other causes which aside from diphtheria might have been at work in this patient.

There was no syphilis. Several Wassermann tests proved negative. The thorough inspection and examination of his body as well as the anamnesis furnished no clew. Moreover, syphilitic paralysis of the accommodation, besides being more frequently monocular than binocular, is usually accompanied by mydriasis, while in this case the pure paralysis of the accommodation was not accompanied by paralysis of the sphincter pupillæ.

We could also from the first with certainty calculate other affections which are known to produce a more or less pronounced ophthalmoplegia interna, as tumors, encephalitis, internal hydrocephalus, tabes, multiple sclerosis, diabetes, kidney diseases, autointoxication by ptomaines from foul meat, sausage, or cheese.

But, we had to think of some other infectious disease like especially influenza, which according to recent observation may, too, produce paralysis of the accommodation; in fact, in the same pure form as in our case, without mydriasis.

It might have been that the tonsillitis in our case had been only an accidental symptom of influenza.

According to Groenouw, ocular paralysis appears in 8 per cent. of the cases of influenza. He has collected more than 60 cases of paralysis of the accommodation after influenza and finds as the only differential sign between it and the postdiphtheritic paralysis that it "shows a greater variability in its symptoms."

The prognosis in ocular paralysis from influenza seems to be altogether good, for I have not been able to find a contrary statement in literature.

This is enough to make it appear improbable that our case might have been due to influenza. Above everything else, however, the history of our case, as the intelligent patient related it in a very exact manner, speaks against such an assumption. He was suddenly taken with pain in the throat, disturbance in swallowing and fever. Pains in the limbs and other signs of influenza he distinctly denies. All symptoms had disappeared after 11 days of treatment when the patient felt so well that he reported for service. About 3 weeks later and while he felt perfectly well he noticed the first disturbance in nearwork, which quickly grew to the state in which I found it, unaltered now, almost 4 years later.

Uhthoff and Groenouw, in the second edition of Graefe-

Saemisch, consider "a preceding sore throat of a slight or more severe character, the diphtheritic nature of which cannot always be determined, and the binocular paralysis of the accommodation with preservation of the pupillary reaction" as decisive for the diagnosis of postdiphtheritic paralysis of the accommodation. According to this our case can be considered as a typical one of this kind. Contrary to Wiegmann's case, in which a monocular paralysis of the accommodation persisted for a prolonged period together with a mydriasis, my case is to be characterized as an absolutely pure case of isolated binocular postdiphtheritic paralysis of the accommodation.

When I examined the patient again in February of this year the paralysis was unchanged, and the man had to be relieved from service as an invalid with a pension.

In conclusion, I want to make a few remarks as to the direct causes, the location and the serum therapy of postdiphtheritic paralysis of the accommodation.

It is the opinion of most of the authorities that hypermetropia is the cause of a predisposition for the appearance of the paralysis, and they explain it by recalling that convalescents usually spend their time in reading and thus strain the muscles of accommodation, which on account of the refractive error are anyhow overworked and thus become palsied. Theoretically we might deduct from this a special tendency of hypermetropes to keep their paralysis permanently. This was not the case in the few well observed cases of persistent paralysis of the accommodation. Stilling and Muehsam do not mention the refractive condition in their cases. In Wiegmann's case one eye was hypermetropic 0.5 D., which may be looked upon as physiologic, while the other eye was emmetropic. My case, too, was slightly ametropic in one eye, which had a myopic astigmatism of 0.5 D.

Opinions differ greatly as to the location of the lesion in paralysis of the accommodation, since in man accurate post mortem examinations have as yet not been made. Bumke, based on the most recent examinations of Saenger and Wilbrand, and of Nonne, thinks that the seat of the paralysis in most cases is to be sought for in the oculomotor nerve itself.

Roemer and Stein, who at the instance of Hess, have studied the question more closely, take a directly opposite position. They support their views by the classical studies of Ehrlich concerning the toxin of diphtheria, according to whom the diphtheria bacillus produces two different substances. The one, the

true toxin, produces the acute symptoms of diphtheria in the throat, while with the other, the toxin, he succeeded in producing paralysis experimentally. The action of the toxon is much slower than that of the toxin. It is, therefore, justifiable to look upon the paralysis of the accommodation as caused by the toxon. Roemer says that the diphtheria toxon, like the botulismus poison, directly attacks the impar small-celled median nucleus, which is thought to be the centre of accommodation, and produces alterations in the ganglion cells which usually are but slight and evanescent. Contrary to what happens in botulismus, the seat of which has been experimentally definitely proven by Roemer and Stein, the centre of the sphincter pupillæ is mostly not affected in diphtheria.

Roemers thinks that his opinion is supported by the relative lack of effect of the serum in paralysis, because its affinity to the toxons is much greater than to the toxins. In this manner, he, also, explains the fact that the paralysis of the accommodation is as frequently observed since the introduction of the serum treatment as it was before. Of course, we must not forget that the serum is employed generally only at the beginning of the diphtheria, while the paralysis, as mentioned above, is to-day usually left without treatment, because it disappears soon by itself. As shown by the 4 cases of persistent postdiphtheritic paralysis of the accommodation here collected the prognosis is not without exception a favorable one. From this standpoint we must call attention to a communication just published in the February number of the *Zeithschrift fuer aertzliche Fortbildung*, according to which Krohm of Halberstadt has succeeded in three severe cases of recent postdiphtheritic muscular paralysis—details unfortunately are wanting—to bring about a rapid improvement and cure by again employing the serum.

LITERATURE.

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Zeitschrift fuer aertzliche Fortbildung, February, 1912.

A CONTRIBUTION TO THE PATHOGENESIS OF
GLAUCOMA.*

BY DR. E. FRICKER.

(From Prof. O. Eversbusch's Clinic, Muenchen.)

Translated by Adolf Alt, M.D.

In spite of the most recent glaucoma theories, the opinion which has long been defended by various authors, namely, that diseases of the closely connected heart—bloodvessel—kidney system play a larger or smaller role in the production of glaucoma, may still be of some importance. Therefore, the increased blood pressure accompanying these affections has been studied of late with especial interest. Already, in 1868, Stellwag von Carion assumed an increase of the arterial blood pressure in the ocular bloodvessels and a direct transference of this increased blood pressure on the contents of the eyeball (*Der intraoculare Druck*, 1868, p. 31), Kuemmell (*Graefe's Arch.*, 79, part 2) determined by Korotkow's auscultatory method the height of the blood pressure in 30 glaucoma patients, and found an appreciable increase in their average blood pressure, especially of the systolic pressure, when compared with normal individuals. Occasionally, however, there is also a case of glaucoma without increased blood pressure, and of course frequently there is an increase of blood pressure without glaucoma. According to Kuemmell, glaucoma is ushered in by an active hyperæmia consequent upon an increased arterial tension, through which the increased transudation from venous stasis, usually due to centrally situated disturbances of circulation, is still further increased. Such an active hyperæmia is found when arteriosclerotic changes of the bloodvessels render the regulation difficult or impossible. The closure of the filtration angle which increases the tension comes later secondarily. Ruata (*Annales d'ocul.*, Jan., 1912, p. 60) arrives at the same results as Kuemmell, and from his studies in a great many glaucoma cases by means of the Riva-Rocci apparatus the height of the blood pressure exerts a great influence on this disease, and he thinks it of importance to consider the blood pressure in the treatment of glaucoma. Kleczkowski (*Klin. Mtsbl. fuer Augenhlk.*, 1911, Vol. XII, p. 417) in 13 cases of glaucoma found invariably an increased

*Klin. Mtsbl. fuer Augenhlk., June, 1912.

bloodpressure and adrenalin in the blood. He considers the influence of the blood pressure as slight, since its action is only momentary, and a rapid regulation of inflow and outflow is the rule in the eye even under pathological conditions; but he attributes great importance to the influence of the adrenalin on the sympathetic nervous system, especially on the fibers of the dilator pupillæ. He says, the dilatation of the pupil due to the adrenalin irritation of these fibers in an eye with increased transudation forms an obstacle to secretion. These results as yet want confirmation. Like Kuemmell, Christensen (*Centrlbl. f. Augenhlk.*, 1911, p. 49), Frenkel (*Arch. d'opht.*, 1905, p. 27), Laquière (*Thèse de Toulouse*, 1907) among others found a close connection between glaucoma and blood pressure. From this there seems to be a clinical connection between glaucoma and increased blood pressure, both of which are parts of a general affection, which is shown by comparative measurements of the arterial and the intraocular tension. Therapeutically this has already been made use of. For many years Eversbusch (*Handbuch d. ges. Therapie*, V, 4th edition, 1911) has with success made venæsection and followed it with diaphoresis in the treatment of glaucoma. Gilbert (*Graefe's Arch.*, 80, part 2) has shown with the tonometer that with the falling of the blood-pressure the greatest diminution of the intraocular pressure occurs in glaucoma simplex, mostly 6 to 24 hours, in glaucoma inflammatorium, mostly 24 to 48 hours after the venæsection (3 to 4 grammes pro kilogramm of body weight), and, therefore, recommends venæsection in the prodromal stage of glaucoma and in proper time before an operation is done. Axenfeld (*Klin. Mtsbl. fuer Augenhlk.*, XLIX, 1911, Vol. II, p. 506), too, explains the diminution of the intraocular pressure in glaucomatous eyes during chloroform narcosis as due to a diminution of the general blood pressure.

In the following desire to report in short on 30 cases of primary glaucoma.

In these cases we paid especial attention to a careful general examination aside from measuring of the blood pressure. Radiography was occasionally used in the internal examination. The blood pressure was usually determined according to von Recklinghausen, less often according to Riva-Rocci and then by calculation changed to the von Recklinghausen values. Since the eye symptoms (mostly cases of glaucoma simplex) showed nothing particular, I refrain from relating the case histories, especially

since the whole glaucoma material of this clinic is going to be worked up by Gilbert from a theoretical and practical standpoint, to be published in *von Graefe's Archiv*.

Of these 30 cases (20 men and 10 women) four were found absolutely free from pathological conditions of the heart, blood-vessels, kidneys and lungs; one of them had tabes. In these four cases the blood pressure averaged 150 after von Recklinghausen, that is the highest normal limit.

In three cases, aside from a strangely high blood pressure averaging 210 v. R., nothing definite was found, although the high blood pressure let it appear very probable that there existed abnormal obstacles in consequence of affections of the heart—bloodvessel—kidney system.

Arteriosclerosis alone was found in 10 cases, with an average blood pressure of 195 v. R.; among these were 5 cases with dilatation of the left heart in the Roentgen plate and 3 with a broadened shadow of the trunk of the aorta. Two cases shortly after having entered the clinic on account of glaucoma died under the symptoms of heart insufficiency.

Arteriosclerosis and interstitial nephritis with an average blood pressure of 205 v. R. was found in 6 cases.

Arteriosclerosis and emphysema with blood pressure of 185 v. R. was seen in 3 cases.

Emphysema with blood pressure of 180 v. R. was observed in 3 cases, one of whom had a substernal struma.

Arteriosclerosis and myodegeneratio cordis with blood pressure at 150 v. R. was seen in 1 case.

When we consider these cases closer the frequency of arteriosclerosis, either alone or combined with heart, kidney or lung affections, is striking. Except in the case with tabes, no other diseases were observed. If we accept 150 v. R. (111 Riva-Rocci) as the highest limit of normal blood pressure, we find in all, except four, a considerable increase of the arterial blood pressure.

The frequency of arteriosclerosis with glaucoma has long been known and been regarded as the cause of a disturbance in circulation, producing an increased inflow of blood during the systole and an insufficient outflow during the diastole; this leads to a permanent dilatation of the capillaries and tendency to increased transudation, and if any further obstacle to the outflow is added, the intraocular pressure is increased. Meurer (*Dissert. Erlangen*, 1884) found in 18 cases of glaucoma 15 times arteriosclerosis,—the blood pressure, is not given. Hirth (*Dissert*

Wuerzburg, 1899) found among 62 cases 46 with arteriosclerosis,—the blood pressure was not measured. Both papers originated in von Michel's clinic.

It would be wrong to assume that arteriosclerosis is the sole cause of glaucoma, for in the complicated pathogenesis of glaucoma, aside from a local disposition, perhaps, other factors may act which as yet we do not know. The diseases of the cardiovascular and renal system accompanied by increased blood pressure are undoubtedly genetically connected with glaucoma and must not be looked upon as casual side issues. To this we may add a great obstacle to respiration, as in emphysema. Therefore, a careful examination of the system with measuring of the blood pressure should not be omitted in any case of glaucoma. In the treatment, too, this should be considered by the making of a venæsection, removal of all blood pressure raising factors by proper diet and mode of living. The exhibition of cardiacs and vasotonics in order to help the regulation of the pressure by removing the venous stasis, as Zimmermann (*Beit. z. Aug-enhkl.*, 1908, part 58, p. 625) has advised, can according to present studies be tried only in those rare cases, where there is no great increase in blood pressure and the appearing of peripheral venous stases is favored by lack of the heart's force. In most glaucoma cases their employment could only do harm, because the blood pressure is increased. Of course these are only secondary measures, but of a causal nature in glaucoma, and do not render the use of miotics or an operation negligible.

MEDICAL SOCIETIES.

AMERICAN OPHTHALMOLOGICAL SOCIETY.

Atlantic City, June 12 and 13, 1912.

Reported by Mrs. M. C. Repp, Philadelphia, Pa.

(Continued from the July number.)

Dr. Dunbar Roy, Atlanta, Ga.—*Report of Six Cases of Degeneration of the Cornea (Nodular Keratitis) in the Same Family.*

These cases are reported because of the rarity of the disease. So far as I can determine the largest number of cases hitherto reported was three (McNab and Fehr). My own cases consisted of a mother and five children all of whom presented the same clinical symptoms, differing only in degree according to ages. The vision was dim and could not be corrected. The cornea showed various opaque spots which projected slightly from the surface. Every known method of treatment was used without result. The absence of all inflammatory signs is one of the cardinal features of the disease. I do not regard the condition as tubercular.

DISCUSSION.

Dr. John E. Weeks, New York City: These cases are very interesting indeed as they are, as we all know, extremely rare. The question in regard to the ætiology, that is in regard to their being tubercular, is one of a good deal of interest. It seems to me, however, that tubercle can be excluded because of the history of the cases. These conditions come on in early youth, although at first they are very slight indeed; but they advance as the individual grows older up to the age of twenty or twenty-one years and then after that they remain very nearly stationary so far as my experience goes. I have observed only a few cases and have read the literature to some extent. Tubercle as it develops in the cornea, is accompanied by more or less inflammation and presents an opacity that is almost characteristic of tubercle; it is quite white in its appearance or very light gray and the tubercle is a miliary tubercle and changes as time goes on. It

has no particular time of development and the history and the clinical picture present a condition which can hardly be confounded, in my opinion, with this disease.

Dr. Frederick Tooke, Montreal, Canada.—*Calcareous Degeneration of the Cornea and Lens Capsule.*

The condition occurred in a male adult following a traumatic ulceration of the cornea several months previous to the enucleation of the eyeball. Vision was lost shortly after the accident. The patient had suffered from recurrent attacks of severe pain and redness about the eye. On examination, the eye showed a light yellowish gray deposit, round in form, in the cornea directly over the pupillary area. A condition of deep injection was present, the eye was painful, and intraocular tension was distinctly raised. Perception of light was absent and enucleation of the eye was performed on account of the glaucomatous condition. Microscopic sections through the cornea show definite deposits of lime salts in the superficial strata of the substantia propria corneæ, most marked over the pupillary area. The deposit is also distinctly evident in the neighborhood of the vessels about the limbus corneæ. It is possible that the deposition of these calcareous salts may have some relationship to Bowman's membrane. There is no definite bone tissue to be made out, and Haversian systems cannot be determined. The characteristic changes occurring in chronic glaucoma are noted at the filtration angle. On cutting through the lens, before imbedding it in celloidin, it cracked like an egg-shell, the lens substance escaping in the form of a clear fluid resembling the vitreous humor in color and consistence. Chemical examination of the calcified lens capsule gave the characteristic reaction for lime salts. Exhibition of macroscopic and microscopic specimens.

Dr. G. E. De Schweinitz and T. B. Holloway, Philadelphia.—*Fracture of the Skull with Hæmorrhage into the Optic Nerve Sheaths and Retinæ, with Microscopic Examination of the Eyeballs.*

The patient, a man aged about fifty-five, was brought unconscious to the University Hospital. Ophthalmoscopic examination revealed in each eye numerous retinal hæmorrhages, superficially situated, and besides in the right eye one large hæmorrhage partly covering the disc above and below, and in the left

eye a similar hæmorrhage covering the whole area of the disc and extending on each side of it. The patient lived only an hour after coming to the hospital, and at the autopsy some fatty degeneration of the heart, with slight fibrosis of the valves, was found. The aorta and coronary vessels were somewhat atheromatous and the kidneys showed granular change. Extending from the posterior occipital protuberance near the parietal suture to the base of the zygoma there was a fissure fracture. A profuse subdural hæmorrhage was found involving the whole cerebrum but not the cerebellum. Microscopic examination of the excised eyeballs showed the position of the hæmorrhages in the ocular tissues.

DISCUSSION.

Dr. Howard F. Hansell, Philadelphia, Pa.: The subject is one of very great interest to the ophthalmologist, the surgeon and the neurologist, and may be looked at from a little different standpoint from the one Dr. Holloway has so ably laid before us. I refer to the cases in which the hyperæmia is diagnosed a week or two after the injury. My attention was called to this by a case in which I was asked to examine the eye ground in the Jefferson Hospital by Dr. Nassau this winter. The patient was a woman 30 years old, whose head had been jammed in a trolley accident. Dr. Nassau was unable to recognize that she had fracture of the skull. When I looked at the eye ground I found decided hyperæmia and tortuosity of the veins without œdema or hæmorrhages. She was in bed and in such a critical state it was impossible to go further with the examination. On my report on the eye ground he determined to operate on the skull and so he did an osteoplastic operation on each temple, with the result of removing a large clot of blood from the meninges on each side. He said that he had done this operation because of my report. The venous hyperæmia of the retina entirely disappeared as the woman recovered. I think then that it was not due to the direct injury but rather a symptom of commencing optic neuritis or choking of the disc such as we see in tumors, because of the collection of a large amount of blood on each side of the skull compressing the circulation and altering the relation of the circulation of the head and of the eyes.

Dr. Frederick Tooke, Montreal, Canada.—*Polypoidal Formation in the Lacrimal Sacs.*

The condition is seldom met with if one is to regard the few cases recorded in ophthalmic literature. This may possibly be due to negligence and waste of material in pathological investigation and research. From a series of fifty lacrimal sacs examined microscopically by the author, two were cases of definite polypoidal structure. The patients were young adults who had complained of epiphora for several years. There had never been any purulent discharge from the sacs, although one patient gave a history of an attack of acute inflammation about the sac occurring a short time prior to its extirpation. The canaliculi had never been slit and the ducts had not been probed. Diagnosis was established by means of the lacrimal syringe. A nasal examination in one case revealed a condition of chronic rhinitis, in the other a deviation of the nasal septum. There were no nasal polypi nor any discharge in any way suggestive of a suppurative condition in the accessory nasal sinuses. Pathological investigation shows these structures to be of the pediculated variety and situated in the neighborhood of the nasal duct. Each was approximately 4 mm. long, the one of a pearl gray color, the other suggestive of a distinctly more vascular formation by its red color. Microscopic examination shows tissue changes suggestive of a process of strangulation rather than suppuration in the mucosa, which is substantiated by the intact condition of the epithelium lining the mucous membrane, the infiltration involving the submucosa only. There were no bacteria found in the tissues.

Dr. Samuel D. Risley, Philadelphia.—*A Case of Bitemporal Hemianopsia with Acromegaly Due to Pituitary Disease. Diagnosis Confirmed by Autopsy Eighteen Months Later.*

I present in brief the history already published in full (*Annals of Ophthalmology*, January, 1912) of a patient aged 65 with bitemporal hemianopsia and well-marked features of acromegaly, adding the autopsy confirming the diagnosis. The symptom complex pointed to disease in the pituitary region and x-ray study showed an enlargement of the sphenoid, the anterior and posterior clinoid processes bending toward each other, forming an incomplete foramen, but left the presence of any enlargement of the soft parts or the presence of a tumor in doubt. The pa-

tient regarded herself in good health, had no pain but suffered from an uncontrollable drowsiness. She was first seen in October, 1910. In December, 1911, and February, 1912, there was no notable change in her condition. In March, 1912, she died of an intercurrent lobar pneumonia. An autopsy was secured for the results of which Dr. Risley was indebted to Dr. David Riesman, of Philadelphia. At the base of the brain a large tumor was found 5 cm. in length and 5 cm. in width and 3.6 inches thick, oval in shape, resting on the frontal lobes, anterior to the optic chiasm and compressing both optic nerves, making a distinct concavity in the mesial aspect of the frontal lobes. Lying in front of the chiasm it was slightly separated from it. On the lower surface of the tumor, near its middle was a smooth, cup-shaped depression $2 \times 2\frac{1}{2}$ cm. in depth, caused by the projecting posterior ethmoidal cells. The tumor was well encapsulated, finely nodular on the surface and the capsule very vascular. In the anterior fossa in front of the sella turcica the floor of the skull was raised in an irregular manner, in an area the size of a small walnut. The bone here was thin, porous, dark in color, and when chiseled away the posterior ethmoid cells were found to contain a large amount of thick yellow purulent material. The tumor seemed to have entirely replaced the pituitary body. The brain otherwise showed nothing abnormal. The tumor proved to be, on examination, a highly vascular spindle cell sarcoma. In the sections no trace of the pituitary body was found.

DISCUSSION.

Dr. Howard F. Hansell, Philadelphia: Dr. Risley mentioned as one of the symptoms of his patient, drowsiness. The only patient I had who died and who had a post mortem examination which revealed the diagnosis of this character, was a man who had some of the symptoms of tumor of the pituitary body without, however, acromegaly. He had partial growing atrophy of the optic nerve without very marked hemianopsia. The symptom that was the most striking, with the exception of the gradual loss of vision, was the drowsiness. He slept for a period of several months for nearly twenty-four hours out of twenty-four. The accurate record was twenty-two hours out of the twenty-four, so I am glad to hear that this was a prominent symptom in Dr. Risley's case, because in most cases of tumor of the pituitary (in literature) I have not been able to find that this was a prominent symptom.

Dr. William K. Rogers, Columbus, O.: A case I have had under observation for the past two years has presented some unusual symptoms. A boy between fourteen and sixteen years of age, in whom the diagnosis of acromegaly had been made by an adequate authority and in whom this symptom of drowsiness is quite prominent, presents a varying degree of choked disc. There is no material alteration in the fields of vision, his visual acuteness varies slightly, but the discs present a coarse variation of elevation from time to time. He has responded occasionally for periods of several months at a time to the use of thyroid extract. Just why I have not determined.

Dr. Edward Jackson, Denver, Colo.: Within a few months I have seen a case of bitemporal hemianopsia where there was absence of any symptoms of pituitary disease and absence of any discoverable lesion of accessory sinuses of the nose, in which a careful study of the case by neurologists resulted in diagnosis of arsenical poisoning. There was also considerable optic atrophy.

Dr. Thomas B. Holloway, Philadelphia: It seems to me that one of the most interesting factors in Dr. Risley's case is the location of the growth. I have recently had occasion to partially cover the literature on this subject and Dr. Risley's is the fifth case that I know of in which the growth had an anterior position.

Dr. Henry H. Tyson, New York City.—*Case of Amblyopia from Inhalation of Methyl-Alcohol.*

The patient, a man, aged twenty-one years, after working two days shellacking the interior of beer vats, suddenly lost his vision with accompanying symptoms of methyl-alcohol poisoning. Examination of the fundi oculorum revealed double optic neuritis, with dark, dilated veins, and extensive retinal oedema, especially along the bloodvessels. Pupils widely dilated, no light nor convergence reaction. Pain behind the eyes during rotation of the globes. Vision, R. E. 1/200; L. E. 2/200. Counted fingers only when held in extreme inferior temporal fields. Under treatment vision improved to 15/20, which has been retained for the past month. The visual fields are markedly contracted for white and colors, with numerous scotomata scattered throughout.

DISCUSSION.

Dr. Peter A. Callan, New York City: The vision in these cases is certainly of interest. I recently saw five cases in the

New York Eye and Ear Infirmary from drinking wood alcohol. One of two of these men who became house patients was able at the end of eight days to see objects around the ward; the other man at the end of the fifth day. At the end of three weeks both men had fairly good vision. At the end of four months it fell in both of these cases and has remained poor so that they can barely pick out the test letters. The peculiar feature in these two cases for the first three weeks after they recovered their fair amount of vision was the field; they had inversion of red and green.

Dr. Robert Sattler, Cincinnati, O.: I am certainly pleased to hear more favorable reports about wood alcohol poisoning. In the two cases I had this was not so. In both cases it was from imbibition. Blindness in both instances was permanent and complete from the first and remained so. Both were strong, healthy men, and both had been working. One spent one day in cleaning out a theatre with wood alcohol. As a result blindness came on during the night; he awakened during the night and found himself blind and remained so. It is certainly gratifying that other cases may occur in which the patients get well.

Dr. William Evans Bruner, Cleveland, O.—*Hereditary Optic Atrophy (Leber's Disease), with X-Ray Findings.*

The patient, a man aged thirty-six, complained of gradual but steady failure of vision for nine months before examination. Family history and clinical symptoms pointed strongly towards Leber's disease, or hereditary optic atrophy. Examination by the Roentgen rays revealed much enlarged sphenoidal cells, but treatment along this line accomplished nothing. Similar examination of two other members of the family, with the same disease, also showed enlarged sphenoidal cells, much larger than in members of the family not having the disease or in normal individuals. While not wishing to present the x-ray findings as the cause of the optic atrophy, I wish to offer it as a subject for further investigation in other patients showing the same disease.

DISCUSSION.

Dr. Alexander Randall, Philadelphia: In reference to the point made of the exaggerated response to the rotation test, I would call attention to the influence, perhaps very great, in these cases of central scotoma and would raise the question, for which

I have not an answer at present, whether all cases of central scotoma in their inability to fix will not show a materially exaggerated response to the nystagmus and rotation test.

Dr. Howard F. Hansell, Philadelphia.—*A Case of Transient Blindness, Complete in One Eye, Partial in the Other, with Double Optic Neuritis.*

A girl, aged eight, had double optic neuritis and œdema of the adjoining retinae, more marked on the right side. The right eye was totally blind, the left counted fingers at three feet. No history of syphilis or tuberculosis, and no cause could be assigned. Immediately after lumbar puncture vision improved; the improvement continued under the use of mercury and potassium iodid until vision was completely restored. The ocular muscles, which also had been disabled, resumed their respective functions.

DISCUSSION.

Dr. Charles H. May, New York City: I would like to relate the history of a patient which resembles that of Dr. Hansell's except in pressure symptoms. A woman of 28, complained of slight dimness of vision; examination of the fundus showed no changes. After a week or two the disc showed slight changes at its margins. After three weeks there was almost total blindness. Then the discs presented more changes and there was some blurring of the outlines, and from the clinical standpoint the diagnosis made would probably have been that of optic neuritis and not of choked disc. The blindness at the end of three or four weeks became complete. She was a very wealthy woman, and all sorts of consultants were called in. The case was seen with me by Dr. Gruening. The family physician examined her, the tuberculin reaction was made, the Wassermann test was made, a neurologist went over the case and absolutely nothing could be found, excepting the slight changes in the discs. Under these circumstances it was decided to have a lumbar puncture performed. This was after the blindness, incomplete at first, complete at the end of three weeks, had lasted for a few days. On the day that the specialist, a man who performs this operation exclusively in New York, arrived the woman objected to the lumbar puncture and said she thought there was just a faint perception of light. I could discover none, but in deference to her wishes the operation was post-

poned. Under these circumstances, not knowing the cause, she was placed in an empirical way upon iodide of potassium in moderate doses and small doses of mercury. After a week there was a return of a little vision. After four weeks the vision had returned so that she had perhaps 50 per cent. of vision. After six weeks vision was normal and the fields were fairly normal, contraction of perhaps 10° or 15° , the optic nerves were beginning to become pale and at the end of three months they began to be bluish-white. The fields are very good with contraction of 10° or 15° . Nobody has ever found out the reason of the slight optic neuritis nor for the pallor of the discs that has persevered, and, if she had had a lumbar puncture performed on that day we would probably have said that her recovery was due to that procedure.

Dr. R. A. Reeve, Toronto, Canada: Exceptionally one will meet with an anomalous case. Just before leaving home a boy was brought to me who had lost the sight of the left eye. He had had absolutely no sign of any disease. He had never had a headache in his life. None of the symptoms of pressure whatever were present and he was a healthy boy. All sorts of tests had been made by experts except the tuberculin test and there was no reason to suspect tubercle, although I advised the usual eye test. I found in his left eye the so-called secondary atrophy of the optic nerve. The nerve was quite pallid, the edges slightly disturbed and the vessels sinuous. The right eye presented the picture of simple optic neuritis and not choked disc. Vision of the right eye was normal, the field of vision was normal and the color fields were normal. The pupillary reaction was normal. As I was just leaving home, I had no opportunity to examine the case further, but I thought I would mention it as one of the anomalous cases different from that presented by Dr. May, but one which seems rather puzzling as to its ætiology and as to its treatment.

Dr. Hiram Woods, Baltimore, Md: It is rather hard sometimes to judge of the effect, apparent effect, of remedies. I had sometime ago a case the result of which I learned only last week. A boy of six years old was sent to me from a town in West Virginia. He was totally blind in both eyes. He had started out to go on a picnic with his family and on the way to the station he had a vomiting attack, was taken home and after that vomiting attack was blind. I tried to get a history of some exposure to poisonous substances. It looked like a sudden attack of

some toxic blindness, but I could not find a history of anything of that kind. The boy had an optic neuritis in both eyes, the swelling was certainly three or four D. We could not get anything but constant blindness, definite neuritis developing. I saw him probably ten days after the blindness came. Dr. Cushing saw him and first he suggested a lumbar puncture. The lumbar puncture was done. The spinal fluid was examined by a Wassermann test and was negative. He was given the von Pirquet test and it was positive, as it usually is in children. Cushing wanted to do a decompression and the parents refused to have it done. The boy left Baltimore without perception of light. He was there ten days. I did not hear any of the further history until I saw the doctor. The attending physician put him on small doses of bichloride of mercury and he has gotten entirely well. The cause of the optic neuritis we never were able to discover.

Dr. Samuel D. Risley, Philadelphia: I have been very much interested in Dr. Hansell's case because it represents, I think, in a measure in many of its aspects some cases I can recall from memory, the inexplicable and more or less sudden blindness, resulting in many instances in recovery under the use of iodide of potassium. As illustrative of this rule, I recall a woman who applied for treatment at the Wills Hospital many years ago, who, while over the ironing board in her kitchen on a hot summer day, suddenly lost her vision and was brought to the hospital. I found œdema of the retina in both eyes, with full veins and a bright red spot at both maculæ. She slowly recovered under the administration of iodide of potassium, but with impaired vision in consequence of the macular changes which were present.

Dr. Cassius D. Westcott, Chicago, Ill.—*Flat Sarcoma of the Choroid.*

The literature of the subject is reviewed, referring to Parsons' paper in 1904 which treats of 31 cases reported up to that date; and to the cases of Knapp, Wooley Henderson, Goldberg, and Luedde reported since 1904. Two new cases are reported:

Case I.—Male, first examined in 1894; refraction taken without a mydriatic, as he refused to allow its use. Vision with correction, R. E., 6/22; L. E., 6/6. In 1897 vision of R. E. was reduced to counting fingers. An optic neuritis was discovered, but no swelling of the choroid or detachment of the retina. He confessed to heavy drinking and to a blow over the right eye and a fractured jaw in 1894 prior to the first examination. He

again refused mydriasis, and did not return for treatment until two years later, at which time the R. E. showed plus tension, partially dilated pupil, milky lens, clouded vitreous, and no fundus details. Despite warnings he failed to return until ten months later, when the cataract was mature, the pupil fully dilated, the anterior chamber almost obliterated, the episcleral vessels engorged, and tension plus 2. Enucleation was performed. An umbrella-shaped tumor of the choroid was found, which perforated the sclera far back. Microscopic examination showed a moderately pigmented, alveolar sarcoma containing large and small, round and spindle-shaped cells. Death one year later from exhaustion, due to metastases involving the liver, lesser omentum, and bone; no recurrence in optic nerve or orbit.

Case II.—Female, aged forty-eight, examined in September, 1910. Complained of poor vision in the right eye, dating from five years before, and growing worse. One year prior to examination she was seen by a colleague, whose records show a diagnosis of neuroretinitis, and vision of 20/200. The eye was now blind from a nearly complete detachment of the retina. Eleven days later patient returned with an acute congestive glaucoma, and confessed to two or three previous attacks. Enucleation was performed on the following day. Microscopic examination revealed a flat melanosarcoma of the choroid with extension through the sclera about and into the optic nerve. No recurrence in nineteen months.

DISCUSSION.

Dr. John E. Weeks, New York City: These cases are not so common. I have examined only one such case and have not reported it. It came under my observation while still an interne at Knapp's clinic.

Dr. S. C. Maxson, Utica, N. Y.—*Report of Three Cases of Sarcoma of the Eye.*

One of my cases was a boy of 19, who complained of dimness of vision and pain in the eye. A tumor the size and color of an apple seed protruded at the upper border of the pupil. Anti-luetic treatment was tried without result and finally the eye was enucleated six weeks after the tumor was noticed. There has been no recurrence one year afterward. Another case was a sarcoma of the choroid in a woman of 68 who complained of pain and almost complete loss of sight. The eye was enucleated

8 months ago and there has been no recurrence. The third was a case of congenital sarcoma of the orbit with exophthalmos associated with about sixty other tumors varying in size from a peanut to chestnut in different parts of the body. The child lived three weeks. I have not been able to get the history of a similar case.

DISCUSSION.

Dr. R. A. Reeve, Toronto, Canada: The reader of the paper gives us, I think, one and a half years as the longest interval without recurrence. In a discussion upon sarcoma in this Society some years ago I reported a case of sarcoma of the orbit in which I had enucleated an eye for acute glaucoma without having had an opportunity of examining the fundus. The patient had cataract. The larger part of the vitreous chamber was occupied by a pigmented sarcoma. The patient recovered promptly and there was no apparent trouble until he presented himself fourteen years afterward when he had sarcoma of the orbit. I ventured the opinion that it was not a recurrence of sarcoma, but a development from a fresh center further back.

Dr. J. E. Weeks, New York City: In regard to sarcoma of the ciliary body I would like to call the attention of the gentlemen to the fact that some of these cases have been described as tubular sarcoma and the cases of tubular sarcoma are really, so far as I have been able to ascertain, carcinoma of the ciliary body springing from the epithelial layer of that body.

Dr. William M. Sweet, Philadelphia.—*A Case of Primary Intradural Tumor of the Optic Nerve.*

Man, aged thirty-three, was struck in the left eye three years previously by a large lump of coal. A year later noticed marked impairment of sight. Beginning exophthalmos about ten months before examination, the protrusion gradually increasing. Hertel's instrument showed R. E. 14 mm., L. E. 29 mm. Eyeball turned upward and slightly inward, with marked limitation of movement downward and outward. Exploratory incision through upper orbital margin, outer side, showed large growth entirely filling apex of orbit, too large to be removed, without enucleation of the eyeball. Pathological examination was made by two pathologists and, while a satisfactory classification was not arrived at, it seemed not to be malignant and to resemble most closely the angioma. There has been no recurrence.

(To be concluded in the September number)